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OF NORTH HEAD, GRAND MANAN

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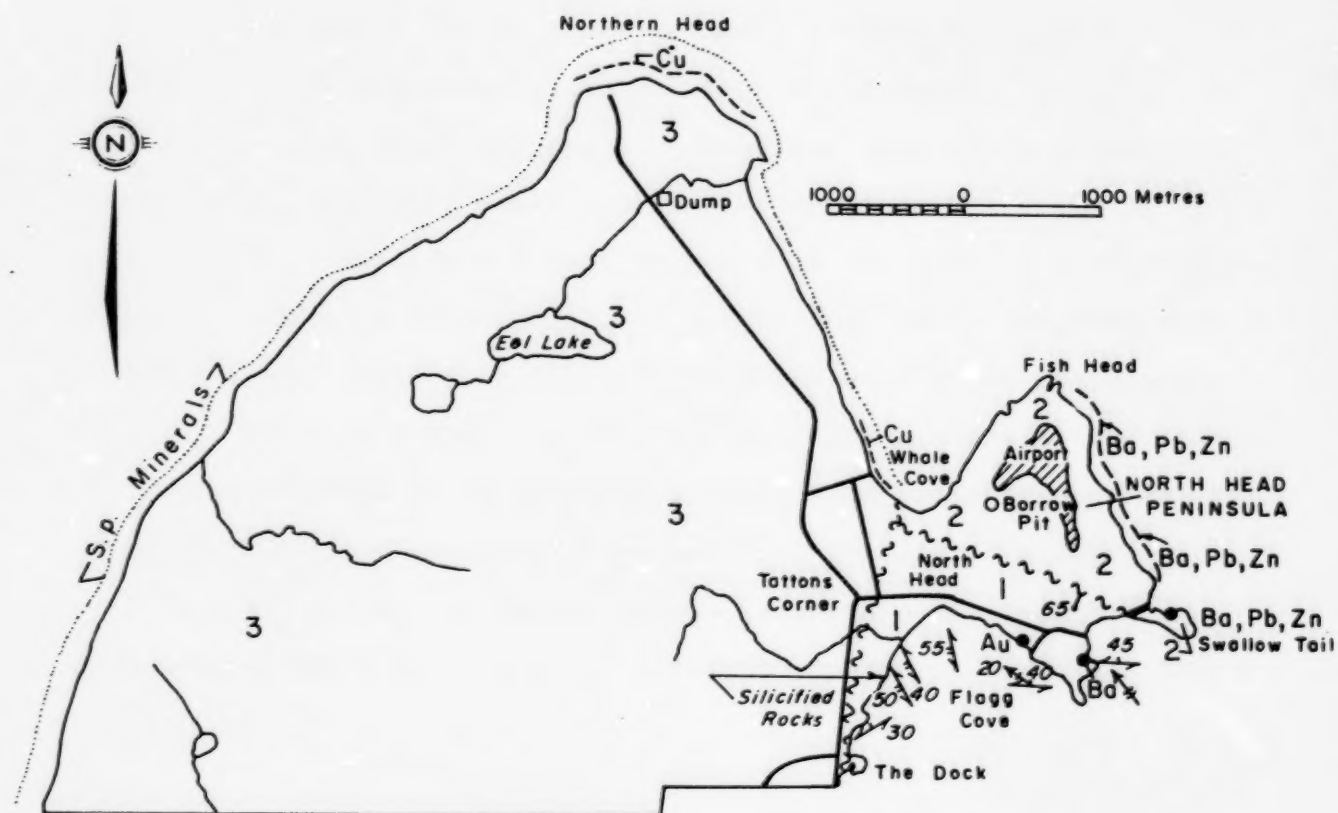
BEDROCK, SURFICIAL AND ENVIRONMENTAL GEOLOGY
OF NORTH HEAD, GRAND MANAN

This report on the bedrock, surficial and environmental geology of North Head was prepared at the request of the Planning Branch, New Brunswick Department of Municipal Affairs, Fredericton, New Brunswick. The village of North Head is situated in the north-eastern part of Grand Manan Island. The area can be reached by a regular ferry service from Black's Harbour on the New Brunswick mainland.

The bedrock geology of North Head was mapped by Alcock (1946). The structural geology was investigated by Stringer and Pajari (1981), who also produced an unpublished structural map of the island. Leggett (1979) described various glacial features, but no map was produced. Hunter and Associates (1982) mapped the surficial geology of part of the area. Figs. 1 and 2 in this report were produced by integration of the earlier maps with field observations by the present writers.

BEDROCK GEOLOGY

The intensely deformed early Paleozoic sedimentary and volcanic rocks exposed on North Head Peninsula are the oldest in the map-area (Fig. 1). A prominent northerly trending fault separates these intensely deformed rocks from gently dipping Triassic volcanic rocks that occupy the entire central and western part of Grand Manan Island.



TRIASSIC

- 3 Basaltic flows and sills

SILURIAN ?

- 2 Mafic flows and gabbro intrusions

CAMBRIAN OR YOUNGER

- 1 Greenish grey and black slate, siltstone, sandstone and conglomerate

↗ ↘ Cleavage (S1), Cleavage (S2)

→→ L1 lineations - F1 fold axes

↗↘ L2 lineations - F2 fold axes

~ ~ ~ Fault

----- Minor disseminated minerals

— Triassic dyke

- Mineral Occurrences : Au - gold ; Ba - barite ; Cu - native copper, malachite and chalcopyrite ; Pb - galena ; Zn - sphalerite ; Sp - semi-precious minerals including amethyst, agate and jasper

Fig. 1 BEDROCK GEOLOGY: North Head Area, Grand Manan

The southern part of North Head Peninsula is a faulted block composed of greenish grey and black slate, siltstone, sandstone and locally conglomerate (Fig. 1, Unit 1). Beds vary in thickness from less than 1 cm to about 1 m. Alcock (1946) correlated these rocks with the Precambrian Green Head Group in Saint John. In general the strata more closely resemble lower Paleozoic assemblages in other parts of the northern Appalachians, but the exact age can not be determined without fossils.

The northern part of North Head Peninsula consists of mafic volcanic rocks intruded by gabbro (Unit 2). These rocks most closely resemble assemblages in the Mascarene-Nerepis Belt of southern New Brunswick (Ruitenbergh 1972; McCutcheon and Ruitenbergh in prep.).

The central and western part of the map-area is composed of thick Triassic basaltic flows and sills (Unit 3). Amygdules filled with calcite, quartz and zeolites are abundant in the upper parts of these flows.

The rocks of North Head Peninsula are all intensely deformed. The pelitic rocks in the southern part of the peninsula exhibit two well-defined cleavages (Fig. 1). The S_1 cleavage is subparallel to bedding (S_g) and no major F_1 folds have been recognized throughout the island (Stringer and Pajari 1981). Bedding (S_g) and cleavage (S_1) were deformed by F_2 folds. The associated axial surface cleavage (S_2) strikes northwest in the map-area.

In contrast to the rocks of North Head, the Triassic basalts have only been gently folded and/or tilted. Alcock (1946) suggested that the faults cutting these rocks are of Jurassic age.

MINERAL OCCURRENCES

Although there are no known economic mineral deposits in the map-area, there are numerous interesting occurrences.

Barite with small amounts of galena and sphalerite occur in a few steeply dipping, massive veins, up to 30 cm thick and as numerous thin fracture fillings in rocks of the North Head Peninsula (Fig. 1). Gold is reported from a quartz vein along the east side of Flagg Cove. Intensely silicified sedimentary rocks immediately north of the dock along this cove may also have potential for gold.

Small amounts of native copper, malachite and chalcopyrite occur in the basaltic flows along Northern Head and the western side of Whale Cove. Amethyst, agate, jasper and zeolites are reported in numerous localities throughout these rocks (Take 1972).

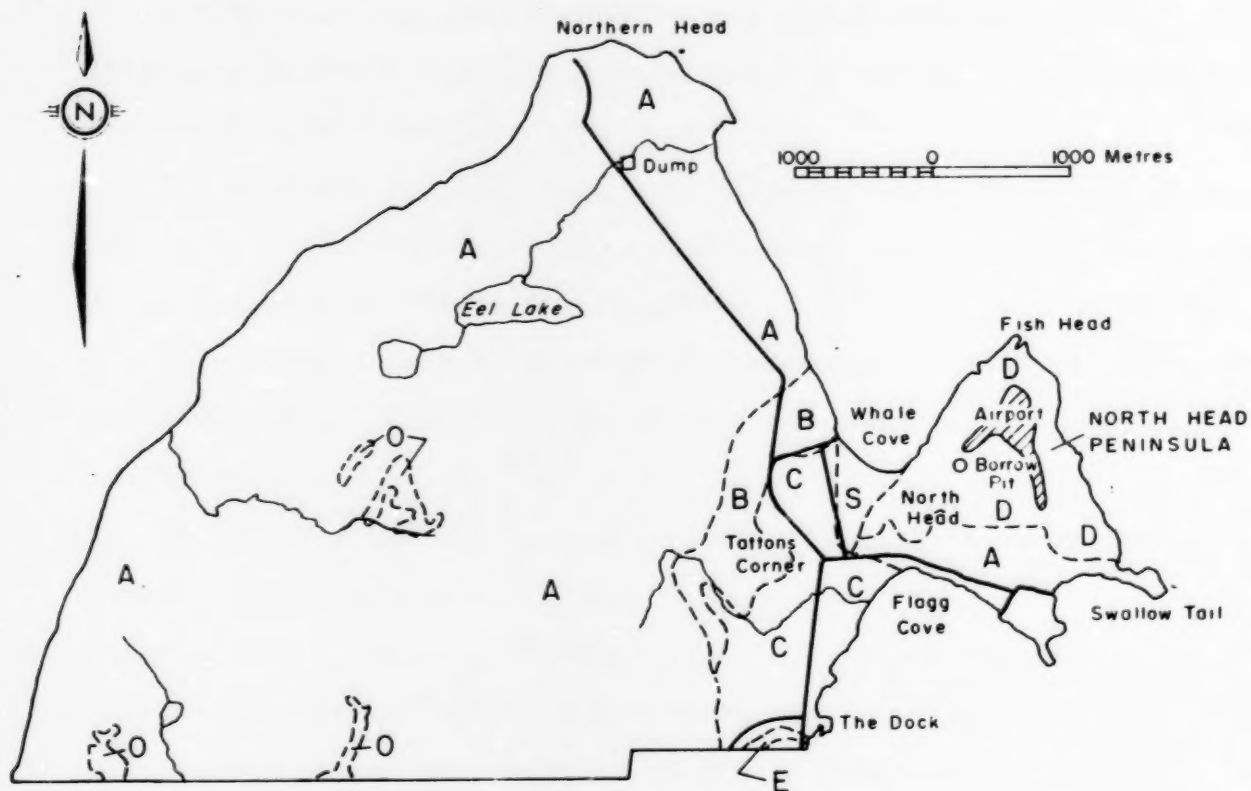
SURFICIAL GEOLOGY

Most of the bedrock in the map-area is covered by a relatively thin, (about 1 m thick) till veneer composed of gravel, sand and boulders (Fig. 2, Unit A).

The extreme western part of the village is situated on a relatively level to hummocky till deposit composed mostly of silty sand and gravel and some boulders (Unit B).

The main part of the village is built on a thin (mostly 1 m thick), outwash deposit (Unit C). The deposit is composed of well-stratified sand and gravel that overlies till and locally bedrock.

The northern part of North Head Peninsula consists of bedrock discontinuously covered by a thin veneer of till and minor outwash (Unit D). Included in this unit is also angular, argillaceous



- O - Swamps and tidal marshes
- E - Alluvium : sand , gravel and silt
- D - Bedrock discontinuously covered by thin veneer of till and minor outwash
- C - Outwash : sand and gravel (mostly 1 m or less thick)
- B - Till : silty sand , gravel and boulders
- A - Till veneer on bedrock : gravel , sand and boulders (mostly 1 m thick)

Fig. 2 SURFICIAL GEOLOGY: North Head Area, Grand Manan

material, referred to by islanders as "gravel", which is exposed immediately south of North Head Airport. Leggett (1980) suggested that this angular material was probably produced as a result of freezing and thawing under permafrost conditions adjacent to glacier fronts.

A small deposit of alluvial sand, gravel and silt (Unit E) is exposed in the southeastern part of the map-area.

ENVIRONMENTAL GEOLOGY

Examination of the coastal sections in the map-area showed a relative abundance of water-bearing fractures both in the lower Paleozoic rocks of North Head Peninsula and the Triassic strata to the west. This was confirmed by adequate water well yields reported by village residents. It is notable though that excessive pumping of wells near the shore could result in salt water incursion.

Although there is an adequate water supply in the village, several people mentioned a problem with water quality resulting from bacterial contamination. This problem is undoubtedly related to a relatively high concentration of houses with private septic systems on thin outwash and till veneer on bedrock, which provide little capacity for filtering waste. This problem could be alleviated with a village sewage system attached to an aerated lagoon or a centralized water supply that could be located in the Triassic basalts west of the village. Both of these solutions would probably be prohibitively expensive for the size of the population. A less expensive way of reducing the bacteria content in the water supply would be by attaching chlorinators to private water supply systems.

SUMMARY AND CONCLUSIONS

1. A fault that extends southerly from Whale Cove separates intensely deformed lower Paleozoic rocks to the east from gently dipping Triassic strata to the west.
2. The southern faulted block that occupies North Head Peninsula is composed of Lower Paleozoic sedimentary rocks in which two well-defined cleavages can be distinguished.
3. The northern part of North Head Peninsula consists of intensely deformed, mafic volcanic rocks of probable Silurian age intruded by gabbro.
4. The central and western part of the map-area is underlain by gently dipping Triassic basaltic flows and sills.
5. No economic mineral deposits are known in the map-area, but there are numerous interesting occurrences. Barite veins with lead-zinc sulphides and gold-bearing quartz veins occur in the lower Paleozoic rocks of North Head Peninsula. There are numerous occurrences of copper minerals, amethyst, agate, jasper, and zeolites in Triassic basalts, which are of interest to mineral collectors.
6. Most of the bedrock in the map-area is overlain with a thin veneer of glacial till. Most of the homes at North Head are on this ground. The homes at Tatton's Corner are mostly on a thin outwash deposit overlying till.
7. Examination of the coastal sections showed an abundance of water-bearing fractures both in the lower Paleozoic and Triassic rocks. This was confirmed by reports from local residents about very adequate well-water yields.
8. Although there presently is an adequate water supply for local

residents, the recharge area for wells close to shore is relatively small and therefore excessive pumping should be avoided there to prevent salt water incursion.

9. A water quality problem related to bacterial contamination in the North Head - Tatton's Corner area is undoubtedly related to the high concentration of houses with private septic systems on till veneer or thin outwash, both of which have limited filtering capacity. This problem could be solved with either a village sewage system attached to an aerated lagoon or a central water supply located in the Triassic basalts. A less expensive solution for reducing the bacteria count would be to attach chlorinators to private water supply systems.

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